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EXAMINER	
BROOKS, JERRY L.	

ART UNIT	PAPER NUMBER
2878	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/596,882	IJZERMAN ET AL.	
	Examiner	**Art Unit**	
	JERRY BROOKS	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-8 and 14 -21 are rejected under 35 U.S.C. 102(b) as being anticipated by Suyama et al (US 7,002,532).

With respect to claim 1, Suyama discloses an optical path length adjuster (fig.55) for varying an optical path length between an input optical path (see the optical path of beam, incident on prism 3401) and an output optical path (see optical beam exiting the right polarization beam splitter 3404), comprising: a first polarization switch for selecting a polarization state for an input beam on the input optical path (3201: see fig. 50: see col.38, lines 10-50) first and second beam splitters (see first (3401) and second beam splitters (3404)) having at least two possible optical paths (the optical path generated by reflecting light from the surface of the first beam splitter and the optical path generated by permitting light to pass through the surface of the first beam splitter) of different lengths there between (see the optical path of the beams in fig.55) for passing the input beam

along a selected (by the polarization beam splitter 3404) one of said at least two possible optical paths according to the selected polarization state of the input beam and for providing an output beam of light (see figure 55 wherein according to polarization the input beam is passed along at least one of said at least two possible optical paths according to the selected polarization), on said optical output path (see optical beam exiting the right polarization beam splitter 3404), that has traveled along the selected optical path(as discussed above).

With respect to claim 2, Suyama discloses the apparatus of claim 1 in which a first one of said possible optical paths extends directly between a first output surface of the first beam splitter and a first input surface of the second beam splitter (see fig.55 wherein one of first said optical paths extends directly between first output surface of the first beam splitter (3401) and a first input surface of the second beam splitter), and a second one of said possible optical paths extends between a second output surface of the first beam splitter and a second input surface of the second beam splitter (see fig.55 wherein a first input surface of the second beam splitter, and a second one of said possible optical paths extends between a second output surface of the first beam splitter and a second input surface of the second beam splitter), via additional optical elements (the optical elements 3405 and 3406).

With respect to claim 3, Suyama discloses in with the additional optical elements include mirror (the optical elements 3405 and 3406 are mirrors).

With respect to claim 4, Suyama discloses the apparatus of claim 2 in which the second optical path includes at least two path segments that are transverse to the input path (see fig.55 wherein the second optical path has at least two path segments (which are incident on and emitted from 3405 and 3406 respectively) that are transverse to the input path).

With respect to claim 5, Suyama discloses the apparatus of claim 4 in which the second optical path includes at least two path segments that are orthogonal to the input path (see fig.55 wherein the second optical path has at least two path segments (which are incident on and emitted from 3405 and 3406 respectively) that are orthogonal to the input path).

With respect to claim 6, Suyama discloses the apparatus claim 1 in which at least one of the possible optical paths (as discussed above) includes a focusing element (3403 and 3402) therein.

With respect to claim 7, Suyama discloses the apparatus of claim 6 in which all of the possible optical paths (see fig.55) include a focusing element (3403 and 3402) therein.

With respect to claim 8, Suyama discloses the apparatus of claim 6, in which the focusing elements include lens elements (3403 and 3402) each

adapted to constrain an image dimension being transmitted along the respective optical path (the possible optical paths disclosed above) to fit within the optics of the associated beam splitter (implicitly disclosed by the use of convex lens: see col.38, lines 20-25).

With respect to claim 14, Suyama discloses a method for varying an optical path length between an input optical path (see the optical path of beam, incident on prism 3401) and an output optical path (see optical beam exiting the right polarization beam splitter 3404) of an optical path length adjuster (fig.55), comprising the steps of: selecting a polarization state for an input beam of light on the input optical path using a first polarization switch (3201)
selecting a polarization state for an input beam of light on the input optical path (3401); passing the input beam into a first beam splitter (3401) and along a selected one of at least two possible optical paths (the optical path generated by reflecting light from the surface of the first beam splitter and the optical path generated by permitting light to pass through the surface of the first beam splitter) of different lengths according to the selected polarization state of the input beam, the at least two possible optical paths extending between the first and a second beam splitter (see figure 55 wherein according to polarization the input beam is passed along at least one of said at least two possible optical paths according to the selected polarization); and providing an output beam of

light, from the second beam splitter, on said optical output path (see optical beam exiting the right polarization beam splitter 3404).

With respect to claim 15, Suyama discloses the method of claim 14 further including the step of causing the light to traverse a plurality of additional optical elements (the optical elements 3405 and 3406 are mirrors) on the second one of said possible optical paths (as discussed above) when the second optical path is selected.

With respect to claim 16, Suyama discloses the method of claim 15 in which the plurality of additional optical elements traversed include mirrors (the optical elements 3405 and 3406 are mirrors).

With respect to 17, Suyama discloses the method of claim 15 in which the light on said second optical path traverses at least two path segments (see the path segments entering and exiting 3405 and 3406 respectively) that are transverse to the input path (see the path of the light beam along the second path).

With respect to claim 18, Suyama discloses the method of claim 17 in which the light on said second optical path (the light traveling through 3403) traverses at least two path segments (see the path segments entering and exiting 3405 and 3406 respectively) that are orthogonal to the input path.

With respect to claim 19, Suyama discloses the method of claim 14 further including the step of passing the light on at least one of the possible optical paths (see fig.55) through a focusing element (3403 and 3402) therein.

With respect to claim 20, Suyama discloses the method of claim 19 further including the step of passing the light on all of the possible optical paths (fig.55) through a focusing element (3403 and 3402) therein.

With respect to claim 21, Suyama discloses method of claim 19 further including adapting the focusing elements (3403 and 3402) to constrain an image dimension being transmitted along the respective optical path to fit within the optics of the associated beam splitter (implicitly disclosed by the use of convex lens: see col.38, lines 20-25).

Claims 1, 9, 10, 14, 22 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Tournois et al. (5,475,525).

With respect to claim I, Tournois discloses an optical path length adjuster (fig.4) for varying an optical path length between an input optical path (see the optical path of beam, incident on polarization switch Mi) and an output optical path (see optical beam exiting the right polarization beam splitter), comprising:

a first polarization switch (Mi) for selecting a polarization state for an input beam on the input optical path (see the optical path of beam, incident on polarization switch Mi); and first and second beam splitters (see first and second beam splitters) having at least two possible optical paths (the optical path generated by reflecting light from the surface of the first beam splitter (the beam splitter adjacent to Mi) and the optical path generated by permitting light to pass through the surface of the first beam splitter) of different lengths there between (see the optical path of the beams in fig.4), for passing the input beam along a selected one of said at least two possible optical paths according to the selected polarization state of the input beam and for providing an output beam of light, on said optical output path (see col.3, lines 1-10), that has traveled along the selected optical path.

With respect to claim 9, Tournois discloses apparatus claim 1 combined with at least one further optical path length adjuster of any preceding claim in a cascade formation (fig.3), such that the output optical path of the first said optical path length adjuster forms the input path of a successive said further optical path length adjuster (see the optical path length adjuster (subscript begins with 1: see fig.3) forms the input path of a successive said further optical path length adjuster (wherein the subscript begins with 2)).

With respect to claim 10, Tournois discloses the apparatus of claim 9 in which the second optical paths of each said optical path length adjuster include different optical path lengths such that a plurality of possible overall optical path lengths are selectable by appropriate selection of path length within each said optical path length adjuster (see fig.3 and P (the reflection devices), wherein the second optical paths of each said optical path length adjuster include different optical path lengths such that a plurality of possible overall optical path lengths are selectable by appropriate selection of path length within each said optical path length adjuster).

With respect to claim 14, Tournois discloses a method for varying an optical path length between an input optical path (see the optical path of beam, incident on polarization switch M1) and an output optical path (see optical beam exiting the right polarization beam splitter 12) of an optical path length adjuster (fig.3, comprises M1, P1, PBS 11, PBS12), comprising the steps of: selecting a polarization state for an input beam of light on the input optical path using a first polarization switch (implicitly disclosed by M1); passing the input beam into a first beam splitter (PBS 11) and along a selected one of at least two possible optical paths (the optical path generated by reflecting light from the surface of the first beam splitter and the optical path generated by permitting light to pass through the surface of the first beam splitter) of different lengths according to the selected polarization state of the input beam(see the optical path of the beams in fig.3), the at least two possible optical paths extending between the first and a second

beam splitter (see first (PBS 11) and second beam splitters (PBS12)); and providing an output beam of light, from the second beam splitter, on said optical output path (see col.3, lines 1-10).

With respect to claim 22, Tournois discloses the method apparatus of any one of claims 14, further including passing light from the output path (the output path of PBS 12) to an input path (PBS21) of a downstream optical path length adjuster (fig.3, comprises M2, P2, PBS 21, PBS22) and repeating the steps for adjusting the optical path length (implicitly disclosed by M1 and M2).

With respect to claim 23, Tournois discloses method of claim 22 further including the step of selecting different optical path lengths within each said optical path length adjuster (implicitly disclosed by first and second path adjusters disclosed above: M2, P2, PBS 21, PBS22 and M1, P1, PBS 11, PBS12).

Claims 1, 11, 14, 24 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Riza (5,329,118).

With respect to claim I, Riza discloses an optical path length adjuster (fig.2 (A)) for varying an optical path length between an input optical path (see the optical path of beam, incident on polarization switch 140) and an output optical path (see optical beam exiting the right polarization beam splitter 164 of 130

subscript 2), comprising: a first polarization switch (140) for selecting a polarization state for an input beam on the input optical path (see the optical path of beam, incident on polarization switch 140); and first and second beam splitters (see first (162) and second beam splitters (164 of 130 subscript 2)) having at least two possible optical paths (the optical path generated by reflecting light from the surface of the first beam splitter and the optical path generated by permitting light to pass through the surface of the first beam splitter) of different lengths there between (see the optical path of the beams in fig.2A), for passing the input beam along a selected one of said at least two possible optical paths according to the selected polarization state of the input beam and for providing an output beam of light, on said optical output path (see col.5, lines 1-25), that has traveled along the selected optical path.

With respect to claim 11, Riza discloses the apparatus of clam 1 as disclosed directly above in which at least some of the possible optical paths (the path between polarizer 162 and 164 of 130 subscript 2) include a further polarization switch (140 subscript 2), therein, each polarization switch operative to select a subsequent optical path or the output path (explicitly disclosed by figure 2A and 170 of fig.2A).

With respect to claim 14, Riza discloses a method for varying an optical path length between an input optical path (see the optical path of beam, incident on

polarization switch 140) and an output optical path (see optical beam exiting the right polarization beam splitter 164 of 130 subscript n) of an optical path length adjuster (fig.2 (A)), comprising the steps of: selecting a polarization state for an input beam of light on the input optical path using a first polarization switch (implicitly disclosed by 140); passing the input beam into a first beam splitter (162) and along a selected one of at least two possible optical paths (the optical path generated by reflecting light from the surface of the first beam splitter and the optical path generated by permitting light to pass through the surface of the first beam splitter) of different lengths according to the selected polarization state of the input beam(see the optical path of the beams in fig.2A), the at least two possible optical paths extending between the first and a second beam splitter (see first (162) and second beam splitters (164 of 130 subscript n)); and providing an output beam of light, from the second beam splitter, on said optical output path (see col.5, lines 1-25).

With respect to claim 24, Riza discloses the method of any one of claims 14 further including the step of selecting a subsequent optical path by way of a further polarization switch (140 subscript 2) within a selected optical path.

With respect to claim 25, Riza discloses the method of claim 24 further including the step of selecting cumulative combinations of one or more of first (through 130), second (through130 subscript 2), and the third optical path (through 130 subscript n) between the first and second beam splitters (162, 164

subscript n) using a polarization switch (140, 140 subscript 2, 140 subscript 3) within each of said first, second and third optical paths.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 13 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suyama et al (US 7,002,532) in view of Sullivan (6,377,229 B1).

With respect to claim 13, Suyama discloses a display device for generating a three-dimensional volumetric image, comprising:

a two-dimensional image display panel (see 3107 and see col.7, lines 55-60) for generating a two-dimensional image; and means (see fig.55) for altering the effective optical path length in front of the display so as to alter the position of the virtual image within the imaging volume, wherein the means for altering the effective optical path length comprises the optical path length adjuster according to claim 1 (as discussed above).

Suyama does not explicitly disclose a first focusing element for projection the two dimensional image to a virtual image in an imaging volume and the means for altering the effective focal path between the display and the first projecting element.

Sullivan discloses A display device for generating a three-dimensional volumetric image, comprising:

a two-dimensional image display panel (124) for generating a two-dimensional image; a first focusing element (22) for projecting the two- dimensional image to a virtual image in an imaging volume (see 118, 116 ,120); and

means (90) for altering the effective optical path length between the display panel (124) and the projecting first focusing element so as to alter the position of the virtual image within the imaging volume (see 118, 116 ,120), wherein the means for altering the effective optical path length comprises the optical path length adjuster (90).

It would have been obvious at the time of invention to modify the display device of Suyama with the first focusing lens and arrangement of Sullivan to improve the quality of the three dimensional image.

With respect to claim 26, Suyama discloses a method for generating a three-dimensional volumetric image, comprising the steps of: generating a two-dimensional image on a two-dimensional image display panel (see 3107 and see col.7, lines 55-60); projecting the two-dimensional image to a virtual image in an imaging volume (see 3103, 3104 and see col.7, lines 55-60); and altering the

optical path length so as to vary the position of the virtual image within the imaging volume according to the method of any one of claim 14 (as discussed above).

Suyama does not disclose the using a first focusing element and altering the path length between the display panel and the projecting focusing element.

Sullivan a method for generating a three- dimensional volumetric image, comprising the steps of: generating a two-dimensional image on a two-dimensional image display panel (124); projecting the two-dimensional image to a virtual image in an imaging volume (see 118, 116 ,120) with a first focusing element (22); and altering the optical path length between the display panel (124) and the projecting focusing element (22)so as to vary the position of the virtual image within the imaging volume (implicitly disclosed by 90).

It would have been obvious at the time of invention to modify method for generating a three dimensional image of Suyama with method step of using a first focusing element and altering the path length between the display panel and the projecting focusing element as taught by Sullivan to improve the quality of the three dimensional image.

Allowable Subject Matter

Claim 12 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With respect to claim 12, the prior of record does not disclose or imply wherein the first beam splitter has a first optical input coupled to the optical output of the first polarization switch, for diverting light at the optical input of the first splitter to first and second optical outputs respectively according to a polarization state of the light at the optical input of the first splitter;

the second beam splitter has first and second optical inputs respectively optically coupled to the first and second outputs of the first beam splitter, via respective said first and second optical paths, the second beam splitter diverting light at the first and second inputs to first and second outputs (i06c, 106d) of the second beam splitter according to a polarisation state of light at the first and second inputs thereof; the first output of the second beam splitter defines the optical output path, and the second output of the second beam splitter is optically coupled to a second input of the first beam splitter via a third optical path; each of the first, second and third optical paths respectively includes one of a second, a third and a fourth polarisation switch, the first, second, third and fourth polarisation switches adapted to thereby select cumulative combinations of one or more of said first, second, and third optical paths between the input optical path and the output optical path, structurally arranged and functional operated as claimed in combination with all the limitations of the base claims .

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JERRY BROOKS whose telephone number is (571)270-5711. The examiner can normally be reached on Monday-Friday, 9 a.m.- 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (571) 272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JERRY BROOKS/
Examiner, Art Unit 2878

/Georgia Y Epps/
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